Access DB# 188361

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: JOHN CHU Examiner #: 68314 Date: 5-2-06
Art Unit: 1752 Phone Number 30X 2-1329 Serial Number: 10/523,491
Mail Box and Bldg/Room Location: 9D51 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

****

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: _____

Inventors (please provide full names): _____

_____

Earliest Priority Filing Date: _____

***For Sequence Searches Only** Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.*

PLEASE SEE ATTACHED.

****

STAFF USE ONLY

Searcher: EJ
Searcher Phone #: _____
Searcher Location: _____
Date Searcher Picked Up: _____
Date Completed: 5-10-06
Searcher Prep & Review Time: 5
~~Clerical Prep Time:~~ _____
Time: 60

Type of Search

NA Sequence (#) _____
AA Sequence (#) _____
Structure (#) ✓ (2)
Bibliographic _____
Litigation _____
Fulltext _____
Patent Family _____
Other _____

Vendors and cost where applicable

STN $ 229.50
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Dr.Link _____
Lexis/Nexis _____
Sequence Systems _____
WWW/Internet _____
Other (specify) _____

01)

188361

Banks, Kendra

From: JOHN CHU [john.chu@uspto.gov]
Sent: Monday, May 01, 2006 4:21 PM
To: STIC-EIC1700
Subject: Database Search Request, Serial Number: 10/523,491

Requester:
JOHN CHU (P/1752)
Art Unit:
GROUP ART UNIT 1752
Employee Number:
68314
Office Location:
REM 09D51
Phone Number:
(571)272-1329
Mailbox Number:

Case serial number:
10/523,491
Class / Subclass(es):
430/270.1
Earliest Priority Filing Date:
8/9/2002
Format preferred for results:
Paper

Search Topic Information:
Please search the polymer wherein the invention is found in formula (I) and its used in a photoresist composition.

Thank you!

John
Special Instructions and Other Comments:

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FILE 'REGISTRY' ENTERED AT 13:01:04 ON 10 MAY 2006
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L2                STR

     FILE 'REGISTRY' ENTERED AT 12:59:12 ON 10 MAY 2006
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L5             24 S L1 AND L2 AND L3 FUL
                  SAV L5 CHU491/A

     FILE 'ZCAPLUS' ENTERED AT 13:00:45 ON 10 MAY 2006
L6             11 S L5

     FILE 'CAOLD' ENTERED AT 13:00:50 ON 10 MAY 2006
L7              0 S L5

     FILE 'REGISTRY' ENTERED AT 13:01:04 ON 10 MAY 2006


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L1                STR
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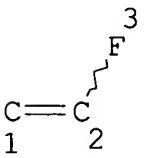


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DEFAULT ECLEVEL IS LIMITED

GRAPH ATTRIBUTES:
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NUMBER OF NODES IS   3

STEREO ATTRIBUTES: NONE
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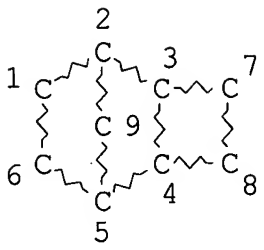

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STEREO ATTRIBUTES: NONE
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L5 24 SEA FILE=REGISTRY SSS FUL L1 AND L2 AND L3

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=> d l6 1-11 cbib abs hitstr hitrn

L6 ANSWER 1 OF 11 ZCAPLUS COPYRIGHT 2006 ACS on STN
2006:71556 Document No. 144:321347 Bis(fluoroalcohol) Monomers and Polymers: Improved Transparency Fluoropolymer Photoresists for Semiconductor Photolithography at 157 nm. Feiring, Andrew E.; Crawford, Michael K.; Farnham, William B.; French, Roger H.; Leffew, Kenneth W.; Petrov, Viacheslav A.; Schadt, Frank L., III; Tran, Hoang V.; Zumsteg, Fredrick C. (DuPont Central Research Development, Wilmington, DE, 19880-0328, USA). Macromolecules, 39(4), 1443-1448 (English) 2006. CODEN: MAMOBX. ISSN: 0024-9297. Publisher: American Chemical Society.
AB Novel norbornene and [4.2.1.02,5]tricyclononene monomers bearing 2

hexafluoro-2-propanol substituents are polymd. with tetrafluoroethylene in soln., giving amorphous, largely alternating copolymers. The norbornene copolymer shows excellent transparency at 157 nm and a dissoln. rate in aq. Me4NOH that is 100,000 times faster than the corresponding polymer with a single hexafluoro-2-propanol substituent on the norbornene ring. Intermediate dissoln. rates are readily obtained using mixts. of the mono- and disubstituted norbornenes. The tricyclononene copolymer is obtained in higher conversion and mol. wt. but has a higher absorbance at 157 nm and a slower dissoln. rate. Partial protection of the fluoroalc. groups as their methoxymethyl derivs. gives photoresist polymers with absorbance of 1.0 .mu.m-1 or less which can be imaged at 157 nm using a photoacid generator.

IT **879175-97-0DP**, reaction product with chloromethyl Me ether (fluoroalc. monomers and polymers: improved transparency fluoropolymer photoresists for semiconductor photolithog. at 157 nm)

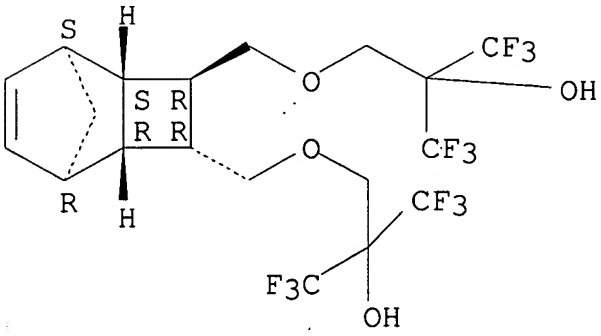
RN 879175-97-0 ZCAPLUS

CN 2-Propanol, 2,2'-[(1R,2R,3R,4R,5S,6S)-tricyclo[4.2.1.02,5]non-7-ene-3,4-diylbis(methyleneoxymethylene)]bis[1,1,1,3,3,3-hexafluoro-, rel-, polymer with tetrafluoroethene (9CI) (CA INDEX NAME)

CM 1

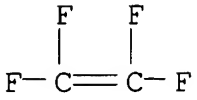
CRN 879175-82-3
CMF C19 H20 F12 O4

Relative stereochemistry.



CM 2

CRN 116-14-3
CMF C2 F4



IT **879175-97-0P 879176-05-3P**
(fluoroalc. monomers and polymers: improved transparency fluoropolymer photoresists for semiconductor photolithog. at 157 nm)

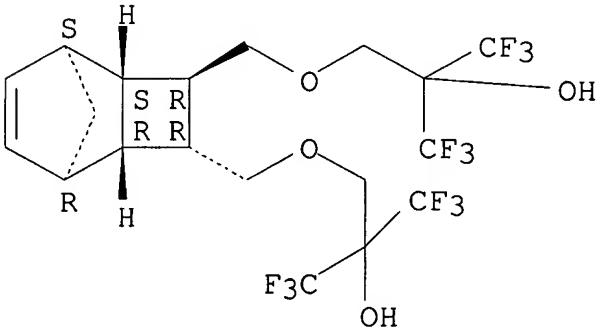
RN 879175-97-0 ZCAPLUS

CN 2-Propanol, 2,2'-[(1R,2R,3R,4R,5S,6S)-tricyclo[4.2.1.02,5]non-7-ene-3,4-diylbis(methyleneoxymethylene)]bis[1,1,1,3,3,3-hexafluoro-, rel-, polymer with tetrafluoroethene (9CI) (CA INDEX NAME)

CM 1

CRN 879175-82-3
CMF C19 H20 F12 O4

Relative stereochemistry.



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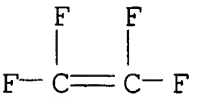
CRN 116-14-3
CMF C2 F4



RN 879176-05-3 ZCAPLUS

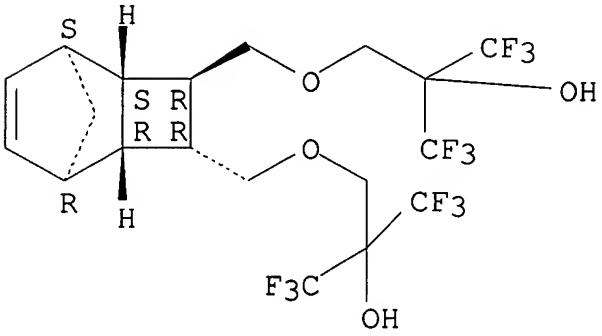
CN 2-Propanol, 2,2'-[(1R,2R,3S,4S)-bicyclo[2.2.1]hept-5-ene-2,3-diylbis(oxymethylene)]bis[1,1,1,3,3,3-hexafluoro-, rel-, polymer

with tetrafluoroethene and rel-2,2'-[(1R,2R,3R,4R,5S,6S)-tricyclo[4.2.1.02,5]non-7-ene-3,4-diylbis(methyleneoxymethylene)]bis[1,1,1,3,3,3-hexafluoro-2-propanol] (9CI) (CA INDEX NAME)

CM 1

CRN 879175-82-3
CMF C19 H20 F12 O4

Relative stereochemistry.



CM 2

CRN 879175-64-1
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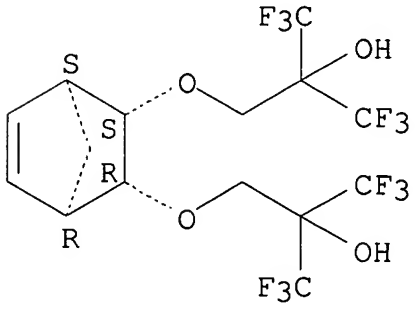
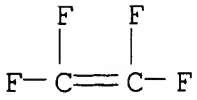
Relative stereochemistry.



CM 3

CRN 116-14-3
CMF C2 F4



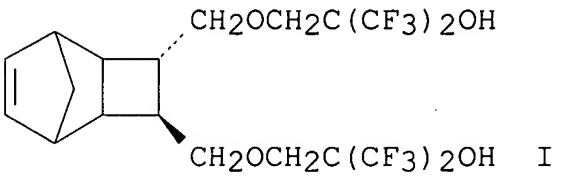
IT **879175-97-0DP**, reaction product with chloromethyl Me ether (fluoroalc. monomers and polymers: improved transparency fluoropolymer photoresists for semiconductor photolithog. at 157 nm)

IT **879175-97-0P 879176-05-3P** (fluoroalc. monomers and polymers: improved transparency fluoropolymer photoresists for semiconductor photolithog. at 157 nm)

L6 ANSWER 2 OF 11 ZCAPLUS COPYRIGHT 2006 ACS on STN

2005:1314037 Document No. 144:52079 Photoresists comprising polymers derived from fluoroalcohol-substituted polycyclic monomers. Crawford, Michael Karl; Tran, Hoang Vi; Schadt, Frank L., III; Zumsteg, Frederick Claus, Jr.; Feiring, Andrew Edward; Fryd, Michael (E.I. Dupont De Nemours and Company, USA). PCT Int. Appl. WO 2005118656 A2 20051215, 57 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IS, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2005-US17325 20050517. PRIORITY: US 2004-2004/PV572734 20040520.

GI



I

AB The invention relates to unsatd. polycyclic compds. contg. two fluoroalc. substituents. The invention also relates to homopolymers and copolymers derived from such unsatd. polycyclic compds. The copolymers are useful for photoimaging compns. and, in particular, photoresist compns. (pos.-working and/or neg.-working) for imaging

in the prodn. of semiconductor devices. The polymers are esp. useful in photoresist compns. having high UV transparency (particularly at short wavelengths, e.g., 157 nm) which are useful as base resins in resists and potentially in many other applications. A typical polymer was manufd. by radical polymn. of 67.5 g fluorodiol I with 30 g tetrafluoroethylene in 1,1,3,3-pentafluorobutane.

IT **871265-69-9DP**, reaction products with chloroalkyl ethers
871265-71-3P
(photoresists comprising polymers derived from polycyclic monomers having 2 fluoroalc. groups)

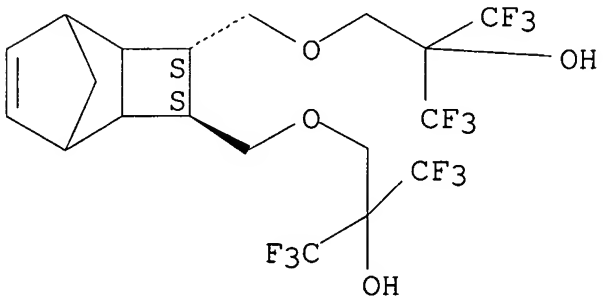
RN 871265-69-9 ZCAPLUS

CN 2-Propanol, 2,2'-[(3R,4R)-tricyclo[4.2.1.02,5]non-7-ene-3,4-diylbis(methyleneoxymethylene)]bis[1,1,1,3,3,3-hexafluoro-, rel-, polymer with tetrafluoroethene (9CI) (CA INDEX NAME)

CM 1

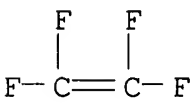
CRN 871265-68-8
CMF C19 H20 F12 O4

Relative stereochemistry.



CM 2

CRN 116-14-3
CMF C2 F4



RN 871265-71-3 ZCAPLUS

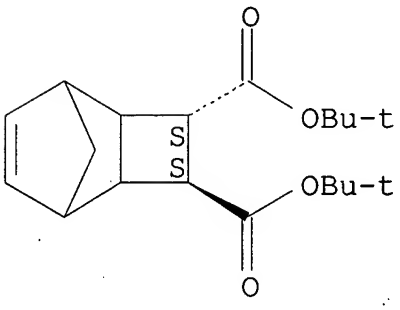
CN Tricyclo[4.2.1.02,5]non-7-ene-3,4-dicarboxylic acid,

bis(1,1-dimethylethyl) ester, (3S,4S)-rel-, polymer with 2,2'-[bicyclo[2.2.1]hept-5-ene-2,3-diylbis(oxymethylene)]bis[1,1,1,3,3,3-hexafluoro-2-propanol], 2-[(bicyclo[2.2.1]hept-5-en-2-yloxy)methyl]-1,1,1,3,3,3-hexafluoro-2-propanol, 3-hydroxytricyclo[3.3.1.13,7]dec-1-yl 2-propenoate and tetrafluoroethene (9CI) (CA INDEX NAME)

CM 1

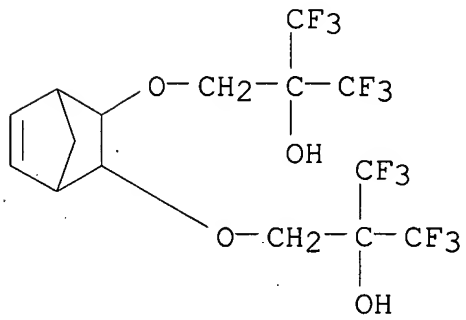
CRN 871265-70-2
CMF C19 H28 O4

Relative stereochemistry.



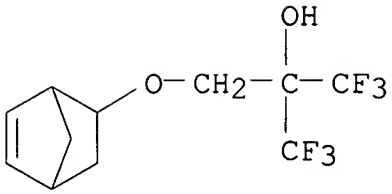
CM 2

CRN 871129-88-3
CMF C15 H14 F12 O4



CM 3

CRN 305815-63-8
CMF C11 H12 F6 O2



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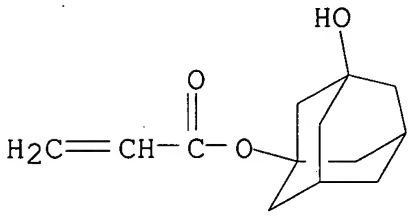

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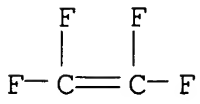
CRN 116-14-3
CMF C2 F4



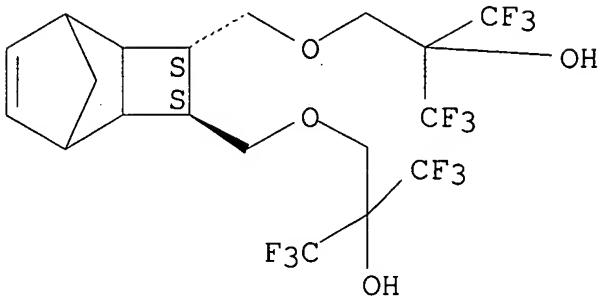
IT **871265-69-9P**
(photoresists comprising polymers derived from polycyclic monomers having 2 fluoroalc. groups)
RN 871265-69-9 ZCAPLUS
CN 2-Propanol, 2,2'-[(3R,4R)-tricyclo[4.2.1.02,5]non-7-ene-3,4-diylbis(methyleneoxymethylene)]bis[1,1,1,3,3,3-hexafluoro-, rel-, polymer with tetrafluoroethene (9CI) (CA INDEX NAME)

CM 1

CRN 871265-68-8

CMF C19 H20 F12 O4

Relative stereochemistry.



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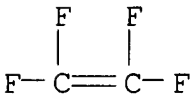
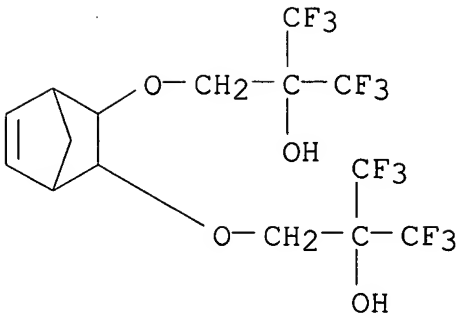
CRN 116-14-3
CMF C2 F4



IT **871129-97-4P 871265-72-4P**
(photoresists comprising polymers derived from polycyclic monomers having 2 fluoroalc. groups)
RN 871129-97-4 ZCAPLUS
CN 2-Propenoic acid, 1,1-dimethylethyl ester, polymer with 2,2'-[bicyclo[2.2.1]hept-5-ene-2,3-diylbis(oxymethylene)]bis[1,1,1,3,3,3-hexafluoro-2-propanol], tetrafluoroethene and 3,3,4,4-tetrafluorotricyclo[4.2.1.02,5]non-7-ene (9CI) (CA INDEX NAME)

CM 1

CRN 871129-88-3
CMF C15 H14 F12 O4



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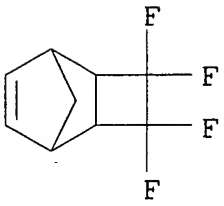

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CRN 1663-39-4
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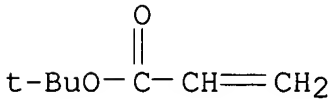

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CRN 116-14-3
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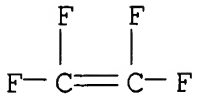
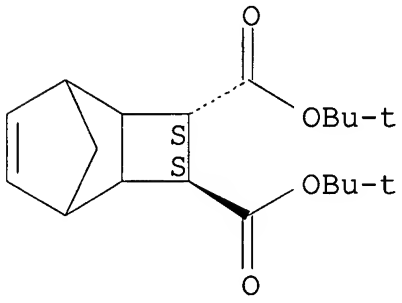


RN 871265-72-4 ZCAPLUS
CN Tricyclo[4.2.1.02,5]non-7-ene-3,4-dicarboxylic acid, bis(1,1-dimethylethyl) ester, (3S,4S)-rel-, polymer with 2,2'-[bicyclo[2.2.1]hept-5-ene-2,3-diylbis(oxymethylene)]bis[1,1,1,3,3,3-hexafluoro-2-propanol], 6,6,7,7-tetrafluoro-1,4,4a,5,6,7,8,8a-octahydro-1,4-methanonaphthalene and tetrafluoroethene (9CI) (CA INDEX NAME)

CM 1

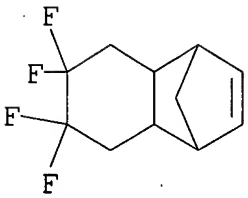
CRN 871265-70-2
CMF C19 H28 O4

Relative stereochemistry.



CM 2

CRN 871129-98-5
CMF C11 H12 F4



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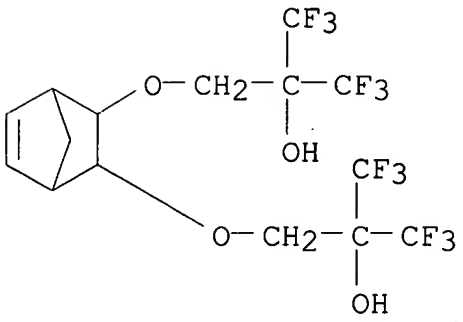

CM 4

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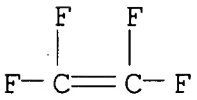


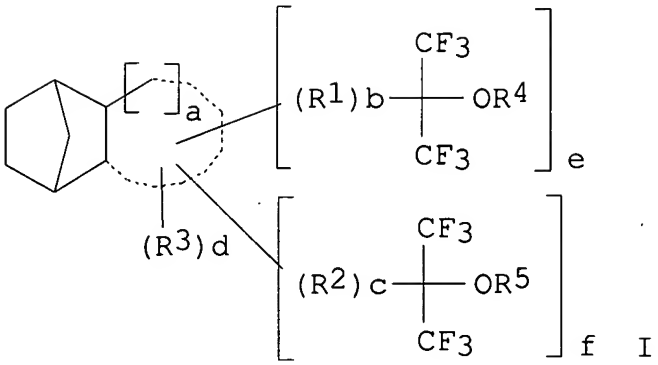
IT **871265-69-9DP**, reaction products with chloroalkyl ethers **871265-71-3P**
(photoresists comprising polymers derived from polycyclic monomers having 2 fluoroalc. groups)

IT **871265-69-9P**
(photoresists comprising polymers derived from polycyclic monomers having 2 fluoroalc. groups)

IT **871129-97-4P 871265-72-4P**
(photoresists comprising polymers derived from polycyclic monomers having 2 fluoroalc. groups)

L6 ANSWER 3 OF 11 ZCAPLUS COPYRIGHT 2006 ACS on STN
2004:271596 Document No. 140:261423 Trifluoromethyl-containing alicyclic monomers, their polymers, and resist materials containing the polymers. Miyazawa, Satoru; Komoritani, Haruhiko; Maeda, Kazuhiko (Central Glass Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2004099689 A2 20040402, 28 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-261323 20020906.

GI



AB The monomers I [R1, R2 = (fluoro)alkyl which may contain cyclic structure; R3 = H, Cl, F, (fluoro)alkyl which may contain cyclic structure and have OH; R4, R5 = H, group having C1-25 linear, branched, cyclic, or arom. hydrocarbyl which may contain F, O, or CO; a = 1-8; b, c = 0, 1; d, e, f .gtoreq. 0; e + f .gtoreq. 1; d + e + f = 2a] and their homo or copolymers are claimed. Also claimed are resist materials contg. the polymers. The polymers have high transparency to broad wavelength from vacuum UV to optical communication, good adhesion to a substrate, and high etching resistance.

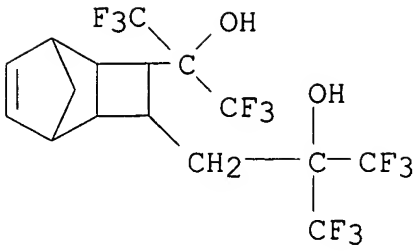
IT **671226-15-6P**
(trifluoromethyl-contg. alicyclic monomers, their polymers, and resist materials contg. the polymers with high transparency to vacuum-UV)

RN 671226-15-6 ZCAPLUS

CN Tricyclo[4.2.1.02,5]non-7-ene-3-ethanol, 4-[2,2,2-trifluoro-1-hydroxy-1-(trifluoromethyl)ethyl]-.alpha.,.alpha.-bis(trifluoromethyl)-, polymer with tetrafluoroethene (9CI) (CA INDEX NAME)

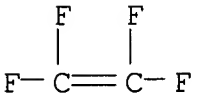
CM 1

CRN 671226-07-6
CMF C16 H14 F12 O2



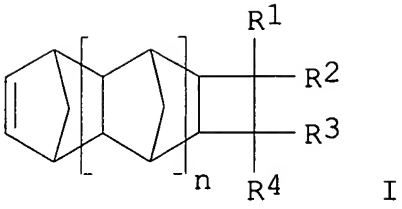
CM 2

CRN 116-14-3
CMF C2 F4



IT **671226-15-6P**
(trifluoromethyl-contg. alicyclic monomers, their polymers, and resist materials contg. the polymers with high transparency to vacuum-UV)

L6 ANSWER 4 OF 11 ZCAPLUS COPYRIGHT 2006 ACS on STN
2004:220374 Document No. 140:271718 Fluoropolymers for photoresists for 157 nm microlithography. Feiring, Andrew E.; Schadt, Frank L., III; Petrov, Viacheslav Alexandrovich; Smart, Bruce Edmund; Farnham, William Brown (E. I. Du Pont De Nemours and Company, USA). PCT Int. Appl. WO 2004022612 A1 20040318, 26 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2003-US25023 20030808. PRIORITY: US 2002-2002/PV402225 20020809.
GI



I

AB The invention provides a polymer having (a) at least one repeat unit derived from an ethylenically unsatd. compd. having at least one fluorine atom covalently attached to an ethylenically unsatd. carbon atom; and (b) at least one repeat unit derived from an ethylenically unsatd. cyclic compd. of structure I; wherein n is 0, 1, or 2; and R1 to R4 are independently H; C1-10 alkyl or alkoxy, optionally substituted by halogen or ether oxygens; or C6-20 aryl. These polymers can be used in making photoresist compns. and coated substrates.

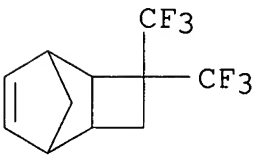
IT **671224-39-8P**
(fluoropolymers for photoresists for 157 nm microlithog.)

RN 671224-39-8 ZCAPLUS

CN Tricyclo[4.2.1.02,5]non-7-ene, 3,3-bis(trifluoromethyl)-, polymer with tetrafluoroethene (9CI) (CA INDEX NAME)

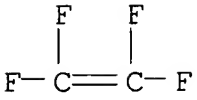
CM 1

CRN 671224-38-7
CMF C11 H10 F6



CM 2

CRN 116-14-3
CMF C2 F4



IT **671224-39-8P**
(fluoropolymers for photoresists for 157 nm microlithog.)

L6 ANSWER 5 OF 11 ZCAPLUS COPYRIGHT 2006 ACS on STN
2004:143196 Document No. 140:181995 Fluorinated polymers having polycyclic groups with fused 4-membered carbocyclic rings, useful as photoresists, and processes for microlithography. Feiring, Andrew E.; Schadt, Frank L., III; Petrov, Viacheslav Alexandrovich; Smart, Bruce Edmund; Farnham, William Brown (E. I. Du Pont De Nemours and Company, USA). PCT Int. Appl. WO 2004014964 A2 20040219, 43 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2003-US25022 20030808. PRIORITY: US 2002-2002/PV40235U 20020809; US 2003-2003/PV440504 20030116.

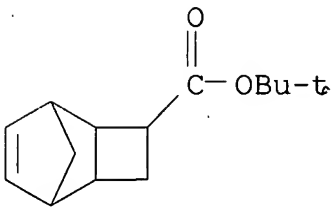
AB This invention provides novel fluorine contg. polymers which comprise at least one fluorinated olefin, at least one polycyclic ethylenically unsatd. monomer with a fused 4-membered carbocyclic ring and, optionally, other components. The polymers are useful for photoimaging compns. and, in particular, photoresist compns. (pos.-working and/or neg.-working) for imaging in the prodn. of semiconductor devices. The polymers are esp. useful in photoresist compns. having high UV transparency (particularly at short wavelengths, e.g., 157 nm) which are useful as base resins in resists and potentially in many other applications.

IT **658074-15-8P 658074-16-9P 658074-17-0P**
658074-25-0P 658074-26-1P 658074-27-2P
658074-28-3P
(fluorinated polymers having polycyclic groups with fused 4-membered carbocyclic rings, useful as photoresists, and processes for microlithog.)

RN 658074-15-8 ZCAPLUS
CN Tricyclo[4.2.1.02,5]non-7-ene-3-carboxylic acid, 1,1-dimethylethyl ester, polymer with 2-[(bicyclo[2.2.1]hept-5-en-2-yloxy)methyl]-1,1,1,3,3,3-hexafluoro-2-propanol and tetrafluoroethene (9CI) (CA INDEX NAME)

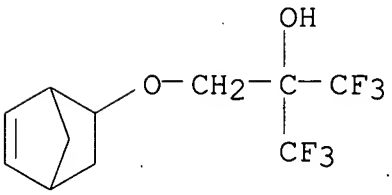
CM 1

CRN 473424-70-3
CMF C14 H20 O2



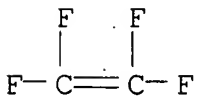
CM 2

CRN 305815-63-8
CMF C11 H12 F6 O2



CM 3

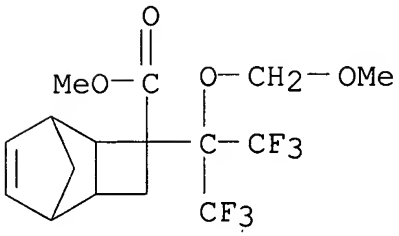
CRN 116-14-3
CMF C2 F4



RN 658074-16-9 ZCAPLUS
CN Tricyclo[4.2.1.02,5]non-7-ene-3-carboxylic acid, 3-[2,2,2-trifluoro-1-(methoxymethoxy)-1-(trifluoromethyl)ethyl]-, methyl ester, polymer with tetrafluoroethene (9CI) (CA INDEX NAME)

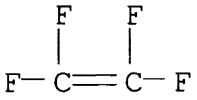
CM 1

CRN 658074-12-5
CMF C16 H18 F6 O4



CM 2

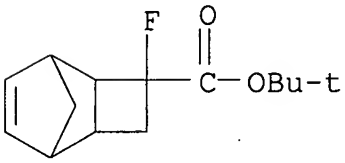
CRN 116-14-3
CMF C2 F4



RN 658074-17-0 ZCAPLUS
CN Tricyclo[4.2.1.02,5]non-7-ene-3-carboxylic acid, 3-fluoro-, 1,1-dimethylethyl ester, polymer with 2-[(bicyclo[2.2.1]hept-5-en-2-yloxy)methyl]-1,1,1,3,3,3-hexafluoro-2-propanol and tetrafluoroethene (9CI) (CA INDEX NAME)

CM 1

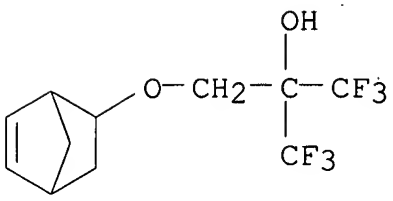
CRN 658074-13-6
CMF C14 H19 F O2



CM 2

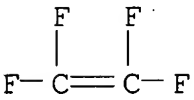
CRN 305815-63-8

CMF C11 H12 F6 O2



CM 3

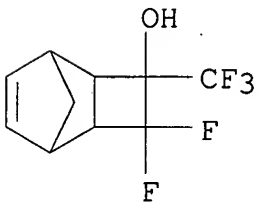
CRN 116-14-3
CMF C2 F4



RN 658074-25-0 ZCAPLUS
CN Tricyclo[4.2.1.02,5]non-7-en-3-ol, 4,4-difluoro-3-(trifluoromethyl)-, polymer with tetrafluoroethene (9CI) (CA INDEX NAME)

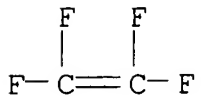
CM 1

CRN 658074-18-1
CMF C10 H9 F5 O



CM 2

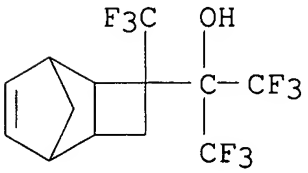
CRN 116-14-3
CMF C2 F4



RN 658074-26-1 ZCAPLUS
CN Tricyclo[4.2.1.02,5]non-7-ene-3-methanol, .alpha.,.alpha.,3-tris(trifluoromethyl)-, polymer with tetrafluoroethene (9CI) (CA INDEX NAME)

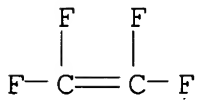
CM 1

CRN 658074-20-5
CMF C13 H11 F9 O



CM 2

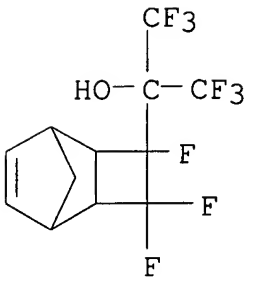
CRN 116-14-3
CMF C2 F4



RN 658074-27-2 ZCAPLUS
CN Tricyclo[4.2.1.02,5]non-7-ene-3-methanol, 3,4,4-trifluoro-.alpha.,.alpha.-bis(trifluoromethyl)-, polymer with tetrafluoroethene (9CI) (CA INDEX NAME)

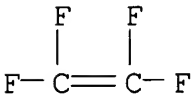
CM 1

CRN 658074-22-7
CMF C12 H9 F9 O



CM 2

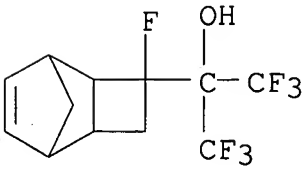
CRN 116-14-3
CMF C2 F4



RN 658074-28-3 ZCAPLUS
CN Tricyclo[4.2.1.02,5]non-7-ene-3-methanol, 3-fluoro-.alpha.,.alpha.-bis(trifluoromethyl)-, polymer with tetrafluoroethene (9CI) (CA INDEX NAME)

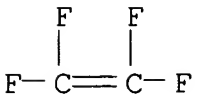
CM 1

CRN 658074-24-9
CMF C12 H11 F7 O



CM 2

CRN 116-14-3
CMF C2 F4



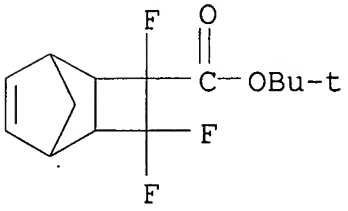
IT **658074-14-7P**
(fluorinated polymers having polycyclic groups with fused 4-membered carbocyclic rings, useful as photoresists, and processes for microlithog.)

RN 658074-14-7 ZCAPLUS

CN Tricyclo[4.2.1.02,5]non-7-ene-3-carboxylic acid, 3,4,4-trifluoro-, 1,1-dimethylethyl ester, polymer with 2-[(bicyclo[2.2.1]hept-5-en-2-yloxy)methyl]-1,1,1,3,3,3-hexafluoro-2-propanol and tetrafluoroethene (9CI) (CA INDEX NAME)

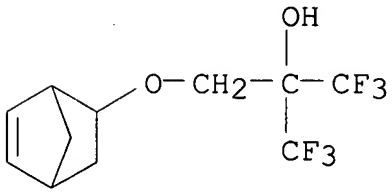
CM 1

CRN 658074-10-3
CMF C14 H17 F3 O2



CM 2

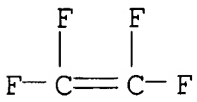
CRN 305815-63-8
CMF C11 H12 F6 O2



CM 3

CRN 116-14-3

CMF C2 F4



IT **658074-15-8P 658074-16-9P 658074-17-0P 658074-25-0P 658074-26-1P 658074-27-2P 658074-28-3P**
(fluorinated polymers having polycyclic groups with fused 4-membered carbocyclic rings, useful as photoresists, and processes for microlithog.)

IT **658074-14-7P**
(fluorinated polymers having polycyclic groups with fused 4-membered carbocyclic rings, useful as photoresists, and processes for microlithog.)

L6 ANSWER 6 OF 11 ZCAPLUS COPYRIGHT 2006 ACS on STN

2003:570007 Document No. 140:261269 Progress towards the development of a 157-nm photoresist for carbon dioxide-based lithography. Zannoni, Luke A.; Simhan, Jay; DeSimone, Joseph M. (Department of Chemistry, Univ. of North Carolina/Chapel Hill, Chapel Hill, NC, 27599, USA). Proceedings of SPIE-The International Society for Optical Engineering, 5039(Pt. 2, Advances in Resist Technology and Processing XX), 1327-1332 (English) 2003. CODEN: PSISDG. ISSN: 0277-786X. Publisher: SPIE-The International Society for Optical Engineering.

AB Photolithog. requires org. solvents and aq. base in the spin-coating, development, and stripping of photoresists. Carbon dioxide, an inexpensive, plentiful, and environmentally sound solvent with tunable solvency, has been proposed as an environmentally friendly alternative to traditional solvents in the electronics industry. Replacing current solvents with CO2 stems from the inherently low viscosity and surface tension of CO2. These properties allow for development of sub 0.1 .mu.m images without image collapse, a potential problem in aq. development. Carbon dioxide has been utilized for the synthesis of fluoropolymers. Therefore, given the high soly. of amorphous fluoropolymers in CO2, and the necessity of fluoropolymers for the next generation of photolithog. (157 nm), CO2 may be an environmentally sound solvent for the synthesis, application, development, and stripping of photoresists. To accomplish this goal, several fluorinated monomers (tetrafluoroethylene, chlorotrifluoroethylene, hexafluoropropylene and vinylidene difluoride) have been copolymd. in dense carbon dioxide with norbornene and norbornene analogs. The resulting polymers have been characterized to det. mol. wt., comonomer

incorporation, Tg, CO2 soly., and absorbance at 157 nm and 193 nm. Attention: many of the materials described are extremely dangerous, great care should be taken before carrying out any similar expts.

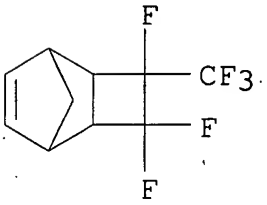
IT **460350-21-4P**
(properties and synthesis of fluoropolymer photoresists in supercrit. CO2 solvent for 157-nm lithog. using CO2 as developer and stripper)

RN 460350-21-4 ZCAPLUS

CN Tricyclo[4.2.1.02,5]non-7-ene, 3,3,4-trifluoro-4-(trifluoromethyl)-, polymer with chlorotrifluoroethene (9CI) (CA INDEX NAME)

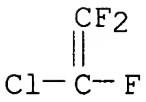
CM 1

CRN 884-95-7
CMF C10 H8 F6



CM 2

CRN 79-38-9
CMF C2 Cl F3



IT **460350-21-4P**
(properties and synthesis of fluoropolymer photoresists in supercrit. CO2 solvent for 157-nm lithog. using CO2 as developer and stripper)

L6 ANSWER 7 OF 11 ZCAPLUS COPYRIGHT 2006 ACS on STN

2003:517786 Document No. 139:343402 Design of very transparent fluoropolymer resists for semiconductor manufacture at 157 nm. Feiring, A. E.; Crawford, M. K.; Farnham, W. B.; Feldman, J.; French, R. H.; Leffew, K. W.; Petrov, V. A.; Schadt, F. L.; Wheland, R. C.; Zumsteg, F. C. (Experimental Station E328/231, Central

Research and Development, E. I. Du Pont de Nemours and Co., Wilmington, DE, 19880-0328, USA). Journal of Fluorine Chemistry, 122(1), 11-16 (English) 2003. CODEN: JFLCAR. ISSN: 0022-1139. Publisher: Elsevier Science B.V..

AB Photolithog. at 157 nm requires development of new photoresists that are highly transparent at this wavelength. Transparent fluoropolymer platforms have been identified which also possess other materials properties required for chem. amplified imaging and aq. development. Polymers of tetrafluoroethylene (TFE), a fluoroalc.-substituted norbornene and an acid-labile acrylate ester show the best combination of properties. A soln., semibatch, free-radical polymn. process was developed allowing synthesis of the terpolymers on a multikilogram scale. Further property enhancements may arise from replacing the norbornene with functionalized tricyclononenes. Formulated resists have been imaged in a 157 nm microstepper.

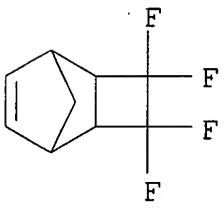
IT **468728-38-3P**
(design of very transparent fluoropolymer resists for semiconductor manuf. at 157 nm)

RN 468728-38-3 ZCAPLUS

CN Tricyclo[4.2.1.02,5]non-7-ene, 3,3,4,4-tetrafluoro-, polymer with tetrafluoroethene (9CI) (CA INDEX NAME)

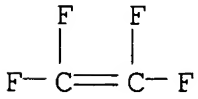
CM 1

CRN 3802-76-4
CMF C9 H8 F4



CM 2

CRN 116-14-3
CMF C2 F4



IT **468728-38-3P**
(design of very transparent fluoropolymer resists for semiconductor manuf. at 157 nm)

L6 ANSWER 8 OF 11 ZCAPLUS COPYRIGHT 2006 ACS on STN
2002:778012 Document No. 137:295374 Polycyclic fluorine-containing polymers and photoresists for microlithography. Feiring, Andrew E.; Schadt, Frank L., III (E. I. Du Pont de Nemours & Co., USA). PCT Int. Appl. WO 2002079287 A1 20021010, 36 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2002-US9799 20020327. PRIORITY: US 2001-PV280269 20010330.

AB Polycyclic fluorine-contg. polymers and photoresists and assocd. processes for microlithog. in the extreme, far, and near UV are disclosed. The polycyclic fluorine-contg. polymer is derived from a repeating unit comprising the polycyclic reaction product of norbornadiene and a fluoroolefin. The polymer may also contain a repeat unit derived from one or more addnl. monomers such as a fluoroolefin, specifically tetrafluoroethylene, a fluoroalc., or an acrylate.

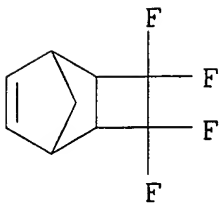
IT **468728-38-3P 468728-40-7P 468728-42-9P**
468728-44-1P 468728-46-3P
(polycyclic fluorine-contg. polymers and photoresists for microlithog.)

RN 468728-38-3 ZCAPLUS

CN Tricyclo[4.2.1.02,5]non-7-ene, 3,3,4,4-tetrafluoro-, polymer with tetrafluoroethene (9CI) (CA INDEX NAME)

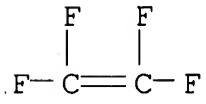
CM 1

CRN 3802-76-4
CMF C9 H8 F4



CM 2

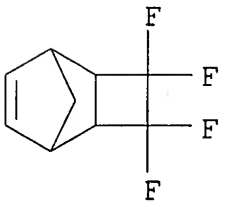
CRN 116-14-3
CMF C2 F4



RN 468728-40-7 ZCAPLUS
CN Tricyclo[4.2.1.02,5]non-7-ene, 3,3,4,4-tetrafluoro-, polymer with bicyclo[2.2.1]hept-2-ene and tetrafluoroethene (9CI) (CA INDEX NAME)

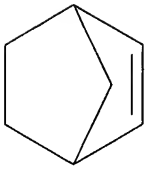
CM 1

CRN 3802-76-4
CMF C9 H8 F4



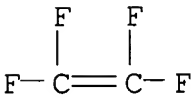
CM 2

CRN 498-66-8
CMF C7 H10



CM 3

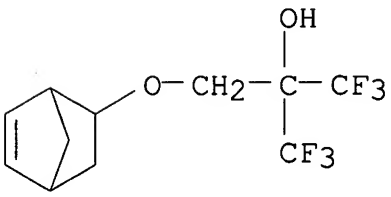
CRN 116-14-3
CMF C2 F4



RN 468728-42-9 ZCAPLUS
CN 2-Propanol, 2-[(bicyclo[2.2.1]hept-5-en-2-yloxy)methyl]-1,1,1,3,3,3-hexafluoro-, polymer with tetrafluoroethene and 3,3,4,4-tetrafluorotricyclo[4.2.1.02,5]non-7-ene (9CI) (CA INDEX NAME)

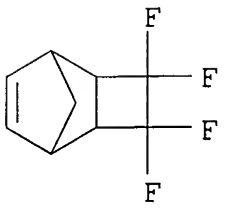
CM 1

CRN 305815-63-8
CMF C11 H12 F6 O2



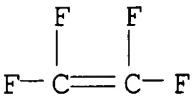
CM 2

CRN 3802-76-4
CMF C9 H8 F4



CM 3

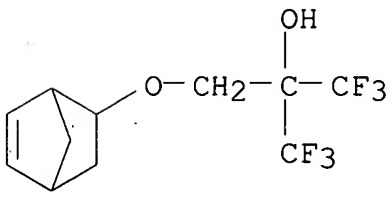
CRN 116-14-3
CMF C2 F4



RN 468728-44-1 ZCAPLUS
CN 2-Propenoic acid, 1,1-dimethylethyl ester, polymer with 2-[(bicyclo[2.2.1]hept-5-en-2-yloxy)methyl]-1,1,1,3,3,3-hexafluoro-2-propanol, tetrafluoroethene and 3,3,4,4-tetrafluorotricyclo[4.2.1.02,5]non-7-ene (9CI) (CA INDEX NAME)

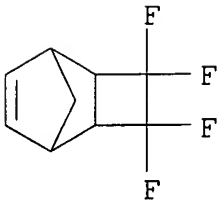
CM 1

CRN 305815-63-8
CMF C11 H12 F6 O2



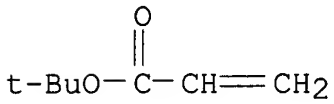
CM 2

CRN 3802-76-4
CMF C9 H8 F4



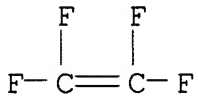
CM 3

CRN 1663-39-4
CMF C7 H12 O2



CM 4

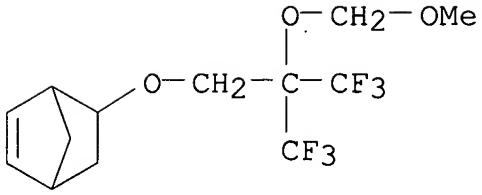
CRN 116-14-3
CMF C2 F4



RN 468728-46-3 ZCAPLUS
CN 2-Propanol, 2-[(bicyclo[2.2.1]hept-5-en-2-yloxy)methyl]-1,1,1,3,3,3-hexafluoro-, polymer with tetrafluoroethene, 3,3,4,4-tetrafluorotricyclo[4.2.1.02,5]non-7-ene and 5-[3,3,3-trifluoro-2-(methoxymethoxy)-2-(trifluoromethyl)propoxy]bicyclo[2.2.1]hept-2-ene (9CI) (CA INDEX NAME)

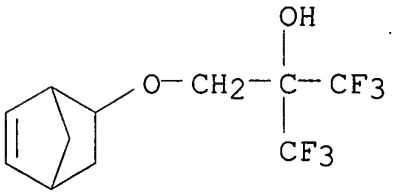
CM 1

CRN 305815-64-9
CMF C13 H16 F6 O3



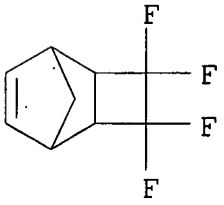
CM 2

CRN 305815-63-8
CMF C11 H12 F6 O2



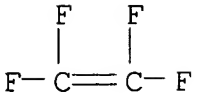
CM 3

CRN 3802-76-4
CMF C9 H8 F4



CM 4

CRN 116-14-3
CMF C2 F4



IT **468728-38-3P 468728-40-7P 468728-42-9P**
468728-44-1P 468728-46-3P
(polycyclic fluorine-contg. polymers and photoresists for microlithog.)

L6 ANSWER 9 OF 11 ZCAPLUS COPYRIGHT 2006 ACS on STN
2002:752423 Document No. 137:286448 Photoresists, polymers and processes for microlithography. Feiring, Andrew E.; Schadt, Frank L., III (E. I. Du Pont de Nemours & Co., USA). Eur. Pat. Appl. EP 1246013 A2 20021002, 33 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR. (English). CODEN: EPXXDW. APPLICATION: EP 2002-252281 20020328. PRIORITY: US 2001-PV280268 20010330.

AB Photoresists and assocd. processes for microlithog. in the extreme, far, and near UV are disclosed. The photoresists comprise (a) a fluorine-contg. copolymer comprising a repeat unit derived from at least one ethylenically unsatd. compd. characterized in that at least one ethylenically unsatd. compd. is polycyclic and at least one ethylenically unsatd. compd. contains at least one fluorine atom covalently attached to an ethylenically unsatd. carbon atom; and (b) at least one photoactive component. In other embodiments, the photoresists comprise a fluorine-contg. copolymer comprising a repeat unit derived from at least one polycyclic ethylenically unsatd. compd. having at least one atom or group selected from the group consisting of fluorine atom, perfluoroalkyl group, and perfluoroalkoxy group, characterized in that the at least one atom or group is covalently attached to a carbon atom which is contained within a ring structure and sepd. from each ethylenically unsatd. carbon atom of the ethylenically unsatd. compd. by at least one covalently attached carbon atom. The photoresists have high transparency in the extreme/far UV as well as the near UV, high plasma etch resistance, and are useful for microlithog. in the extreme, far, and near UV region, particularly at wavelengths .ltoreq. 365 nm. Novel fluorine-contg. copolymers are also disclosed.

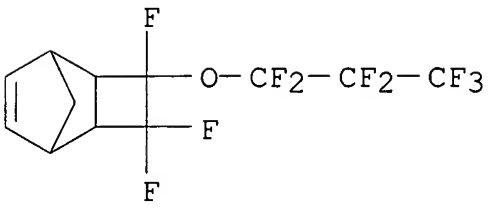
IT **262617-20-9P**
(photoresists, polymers and processes for microlithog.)

RN 262617-20-9 ZCAPLUS

CN 2-Propenoic acid, 1,1-dimethylethyl ester, polymer with tetrafluoroethene and 3,3,4-trifluoro-4-(heptafluoropropoxy)tricyclo[4.2.1.02,5]non-7-ene (9CI) (CA INDEX NAME)

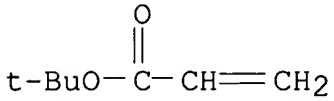
CM 1

CRN 262617-19-6
CMF C12 H8 F10 O



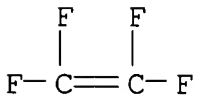
CM 2

CRN 1663-39-4
CMF C7 H12 O2



CM 3

CRN 116-14-3
CMF C2 F4



IT **262617-20-9P**
(photoresists, polymers and processes for microlithog.)

L6 ANSWER 10 OF 11 ZCAPLUS COPYRIGHT 2006 ACS on STN
2002:559899 Document No. 137:255193 Synthesis, characterization and properties of copolymers prepared in dense carbon dioxide towards the development of a 157 nm photoresist. Zannoni, Luke A.; DeSimone, Joseph M. (Department of Chemistry, University of North Carolina at Chapel Hill, Chapel Hill, NC, 27599-3290, USA). PMSE

Preprints, 87, 197-198 (English) 2002. CODEN: PPMRA9. ISSN: 1550-6703. Publisher: American Chemical Society.

AB Synthesis of fluorinated copolymers in CO2 was studied in order to develop a photoresist which can be spin-coated, developed and stripped with CO2. By altering the structure of norbornene co-monomer unit, CO2 soly. of the polymer was obtained. Caution, many of the materials used are extremely dangerous, great care should be taken before carrying any similar expts.

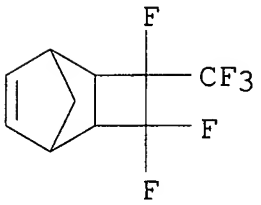
IT **460350-21-4P 460350-22-5P**
(synthesis of fluorinated copolymers in dense CO2 for development of 157 nm photoresist which can be spin-coated, developed and stripped with CO2)

RN 460350-21-4 ZCAPLUS

CN Tricyclo[4.2.1.02,5]non-7-ene, 3,3,4-trifluoro-4-(trifluoromethyl)-, polymer with chlorotrifluoroethene (9CI) (CA INDEX NAME)

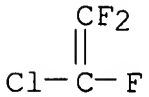
CM 1

CRN 884-95-7
CMF C10 H8 F6



CM 2

CRN 79-38-9
CMF C2 Cl F3

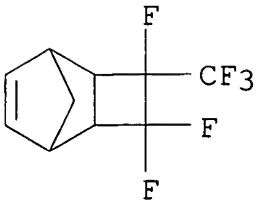


RN 460350-22-5 ZCAPLUS

CN Tricyclo[4.2.1.02,5]non-7-ene, 3,3,4-trifluoro-4-(trifluoromethyl)-, polymer with 1,1-difluoroethene (9CI) (CA INDEX NAME)

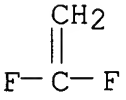
CM 1

CRN 884-95-7
CMF C10 H8 F6



CM 2

CRN 75-38-7
CMF C2 H2 F2



IT **460350-21-4P 460350-22-5P**
(synthesis of fluorinated copolymers in dense CO2 for development of 157 nm photoresist which can be spin-coated, developed and stripped with CO2)

L6 ANSWER 11 OF 11 ZCAPLUS COPYRIGHT 2006 ACS on STN
2000:210534 Document No. 132:258158 Photoresist for microlithography. Feiring, Andrew Edward; Feldman, Jerald (E. I. Du Pont de Nemours & Co., USA). PCT Int. Appl. WO 2000017712 A1 20000330, 54 pp. DESIGNATED STATES: W: AE, AL, AU, BA, BB, BG, BR, CA, CN, CR, CU, CZ, EE, GD, GE, HR, HU, ID, IL, IN, IS, JP, KP, KR, LC, LK, LR, LT, LV, MG, MK, MN, MX, NO, NZ, PL, RO, SG, SI, SK, SL, TR, TT, UA, US, UZ, VN, YU, ZA, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 1999-US21912 19990921. PRIORITY: US 1998-101502 19980923; US 1999-120045 19990212.

AB A photoresist for microlithog. in the extreme, far, and near UV is disclosed. The photoresist comprises (a) a fluorine-contg. copolymer comprising a repeat unit derived from at least one ethylenically unsatd. compd. characterized in that at least one ethylenically unsatd. compd. is polycyclic and at least one ethylenically unsatd. compd. contains at least one fluorine atom covalently attached to an ethylenically unsatd. carbon atom and (b)

at least one photoactive component. In other embodiments, the photoresist comprises a fluorine-contg. copolymer comprising a repeat unit derived from at least one polycyclic ethylenically unsatd. compd. having at least one atom or group selected from the group consisting of fluorine atom, perfluoroalkyl group, and perfluoroalkoxy group, characterized in that the at least one atom or group is covalently attached to a carbon atom which is contained within a ring structure and sepd. from each ethylenically unsatd. carbon atom of the ethylenically unsatd. compd. by at least one covalently attached carbon atom.

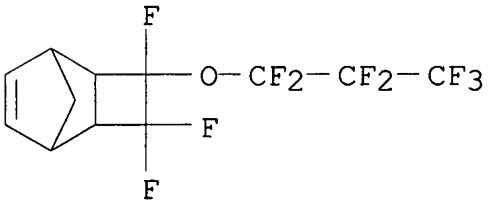
IT **262617-20-9P**
(prepn. and use in prepg. UV photoresists for microlithog.)

RN 262617-20-9 ZCAPLUS

CN 2-Propenoic acid, 1,1-dimethylethyl ester, polymer with tetrafluoroethene and 3,3,4-trifluoro-4-(heptafluoropropoxy)tricyclo[4.2.1.02,5]non-7-ene (9CI) (CA INDEX NAME)

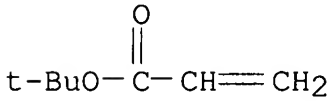
CM 1

CRN 262617-19-6
CMF C12 H8 F10 O



CM 2

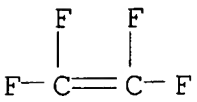
CRN 1663-39-4
CMF C7 H12 O2



CM 3

CRN 116-14-3

CMF C2 F4



IT **262617-20-9P**
(prepn. and use in prepg. UV photoresists for microlithog.)

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Bib Data Sheet

CONFIRMATION NO. 3860

SERIAL NUMBER	FILING OR 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/523,491	02/03/2005 RULE	430	1752	SR0019USPCT

APPLICANTS

Andrew E. Feiring, Wilmington, DE;
Frank L. Schadt, III, Wilmington, DE;
Viacheslav Alexandrovich Petrov, Hockessin, DE;
Bruce Edmund Smart, Wilmington, DE;
William Brown Farnham, Hockessin, DE;

**** CONTINUING DATA ***************************

This application is a 371 of PCT/US03/25022 08/08/2003
which claims benefit of 60/402,350 08/09/2002
and claims benefit of 60/440,504 01/16/2003 *
(*)Data provided by applicant is not consistent with PTO records.

**** FOREIGN APPLICATIONS *********************

Foreign Priority claimed	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ yes ☐ no	DE		45	4
35 USC 119 (a-d) conditions met ☐ yes ☐ no ☐ Met after Allowance				
Verified and Acknowledged Examiner's Signature Initials				

ADDRESS

E I du Pont de Nemours & Company
Legal Patents
Wilmington ,DE 19898

TITLE

Fluorinated polymers having polycyclic groups with fused 4-membered carbocyclic rings, useful as photoresists, and processes for microlithography

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
2350	No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

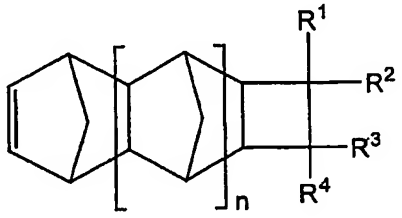
CLAIMS

What is claimed is:

1. A polymer comprising a repeat unit derived from

(a) at least one repeat unit derived from an ethylenically unsaturated compound having at least one fluorine atom covalently attached to an ethylenically unsaturated carbon atom; and

(b) at least one repeat unit derived from an ethylenically unsaturated compound having the structure:



(I)

wherein n is 0, 1, or 2;

R^1, R^2, R^3 and R^4 are independently H, OR^5, halogen, alkyl or alkoxy of 1 to 10 carbon atoms, optionally substituted by halogen or ether oxygens, Y, $C(R_f)(R_f')OR^5$, R^6Y or OR^6Y;

Y is COZ or SO_2Z;

R^5 is hydrogen or an acid-labile protecting group;

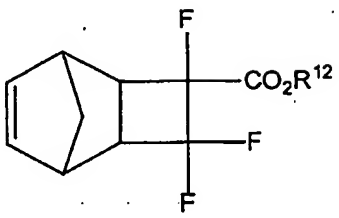
R_f and R_f' are the same or different fluoroalkyl groups of 1 to 10 carbon atoms or taken together are $(CF_2)_m$ where m is 2 to 10;

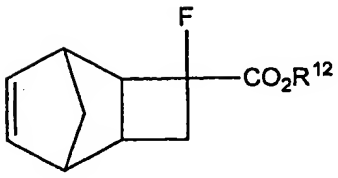
R^6 is an alkylene group of 1 to 20 carbon atoms, optionally substituted by halogen or ether oxygen;

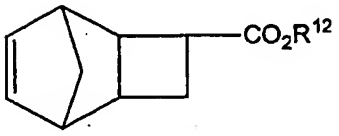
Z is OH, halogen, or OR^7; and

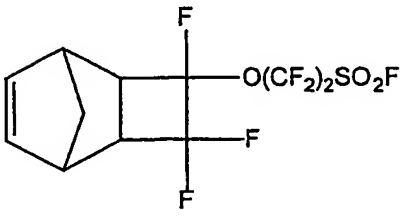
R^7 is an alkyl group of 1 to 20 carbon atoms, with the proviso that at least one of R^1, R^2, R^3 and R^4 is Y, OR^5, $C(R_f)(R_f')OR^5$, R^6Y or OR^6Y, and the proviso that if R^1 (or R^3) is OH, R^2 (or R^4) is not OH or halogen.

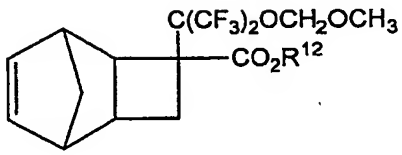
2. The polymer of Claim 1, wherein the compound having structure (I) is selected from the group consisting of:

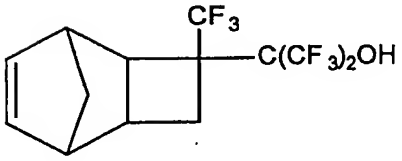


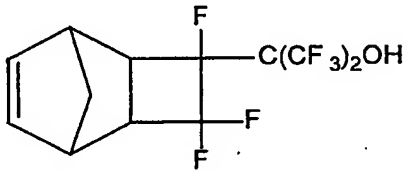


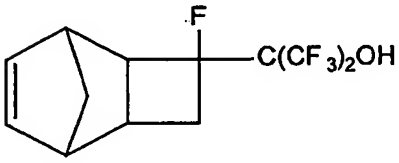


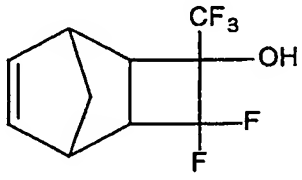












wherein R^{12} is an alkyl group of 1 to 20 carbon atoms.

3. The polymer of Claim 1, wherein the at least one ethylenically unsaturated compound having at least one fluorine atom covalently attached to an ethylenically unsaturated carbon atom is a fluoroolefin which comprises 2 to 20 carbon atoms.

4. The polymer of Claim 3, wherein the fluoroolefin is selected from the group consisting of tetrafluoroethylene; hexafluoropropylene; chlorotrifluoroethylene; vinylidene fluoride; vinyl fluoride; perfluoro-(2,2-dimethyl-1,3-dioxole); perfluoro-(2-methylene-4-methyl-1,3-dioxolane);

$CF_2=CFO(CF_2)_tCF=CF_2$, wherein t is 1 or 2; and $R_f''OCF=CF_2$ wherein R_f'' is a saturated fluoroalkyl group of from 1 to 10 carbon atoms.

5. The polymer of Claim 4, wherein the fluoroolefin is tetrafluoroethylene.

6. The polymer of Claim 1, further comprising a unit containing a fluoroalcohol group or a protected fluoroalcohol group.

7. The polymer of Claim 6, wherein the fluoroalcohol group or the protected fluoroalcohol group is derived from at least one ethylenically unsaturated compound containing a fluoroalcohol group having the structure:

$$-C(R_f)(R_f')OH$$

wherein R_f and R_f' are the same or different fluoroalkyl groups of from 1 to 10 carbon atoms or taken together are $(CF_2)_m$ wherein m is 2 to 10.

8. The polymer of Claim 7, wherein R_f and R_f' are perfluoroalkyl groups.

9. The polymer of Claim 1, further comprising a unit containing a fluoroalcohol group having the structure:

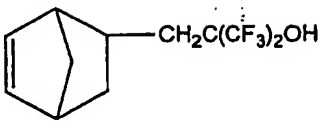
$$-XCH_2C(R_f)(R_f')OH$$

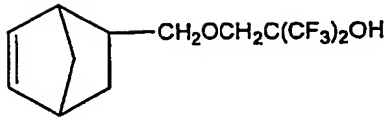
wherein R_f and R_f' are the same or different fluoroalkyl groups of from 1 to 10 carbon atoms or taken together are $(CF_2)_m$ wherein m is 2 to 10; and X is an element from Group VA or Group VIA of the Periodic Table of the Elements.

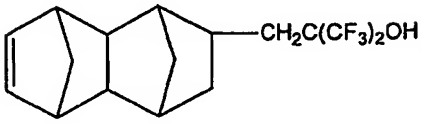
10. The polymer of Claim 9, wherein X is selected from the group consisting of oxygen, sulfur, nitrogen and phosphorous.

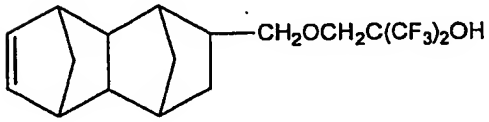
11. The polymer of Claim 10, wherein X is oxygen.

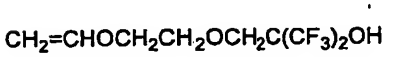
12. The polymer of Claim 7, wherein fluoroalcohol group or the protected fluoroalcohol group is derived from a monomer selected from the group consisting of:

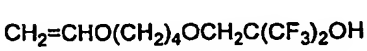


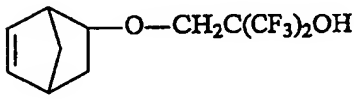


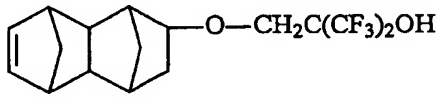




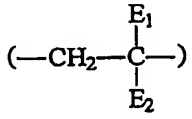








13. The polymer of Claim 1 further comprising at least one acid-containing or protected acid-containing group of structural unit:



wherein E_1 is H or C_1-C_{12} alkyl; E_2 is CO_2E_3, SO_3E, or other acidic group; and E and E_3 are independently selected from the group of H, unsubstituted C_1-C_{12} alkyl, and heteroatom substituted C_1-C_{12} alkyl.

14. The polymer of Claim 13, wherein the heteroatom is selected from the group consisting of oxygen, nitrogen, sulfur, halogen and phosphorus atoms.

15. The polymer of Claim 14, wherein the heteroatom is oxygen, and the heteroatom substituted C_1-C_{12} alkyl further comprises a hydroxyl group.

16. The polymer of Claim 13, wherein the acid-containing or protected acid-containing group is derived from a carboxylic acid-containing monomer.

17. The polymer of Claim 13, wherein the acid-containing or protected acid-containing group is derived from a monomer selected from the group consisting of tert-butyl acrylate; 2-methyl-2-adamantyl acrylate; 2-methyl-2-norbornyl acrylate and acrylic acid.

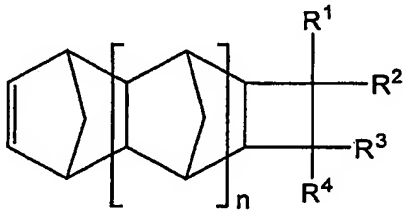
18. The polymer of Claim 1, further comprising at least one group derived from a polar monomer.

19. A photoresist composition comprising:

(1) a fluorine-containing polymer, wherein the fluorine-containing polymer comprises:

(a) at least one repeat unit derived from an ethylenically unsaturated compound having at least one fluorine atom covalently attached to an ethylenically unsaturated carbon atom; and

(b) at least one repeat unit derived from an ethylenically unsaturated compound having the structure:



(I)

wherein n is 0, 1, or 2;

R^1, R^2, R^3 and R^4 are independently H, OR^5, halogen, alkyl or alkoxy of 1 to 10 carbon atoms, optionally substituted by halogen or ether oxygens, Y, $C(R_f)(R_f')OR^5$, R^6Y or OR^6Y;

Y is COZ or SO_2Z;

R^5 is hydrogen or an acid-labile protecting group;

R_f and R_f' are the same or different fluoroalkyl groups of 1 to 10 carbon atoms or taken together are $(CF_2)_m$ where m is 2 to 10;

R^6 is an alkylene group of 1 to 20 carbon atoms, optionally substituted by halogen or ether oxygen;

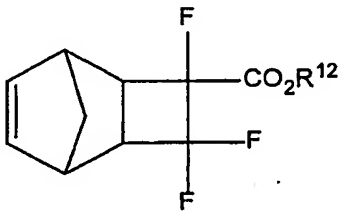
Z is OH, halogen, or OR^7; and

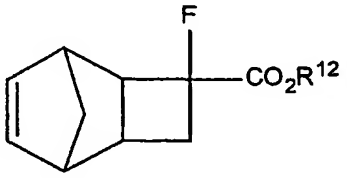
R^7 is an alkyl group of 1 to 20 carbon atoms, with the proviso that at least one of R^1, R^2, R^3 and R^4 is OR^5, Y, $C(R_f)(R_f')OR^5$, R^6Y or OR^6Y,

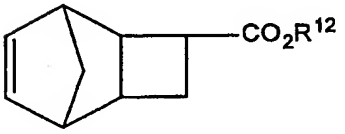
and the proviso that if R^1 (or R^3) is OH, R^2 (or R^4) is not OH or halogen; and

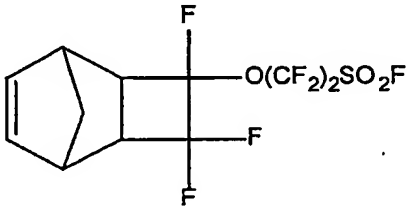
(2) a photoactive component.

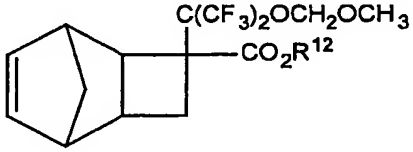
20. The photoresist composition of Claim 19, wherein the monomer having structure (I) in the fluorine-containing polymer is selected from the group consisting of:

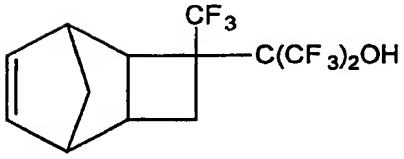


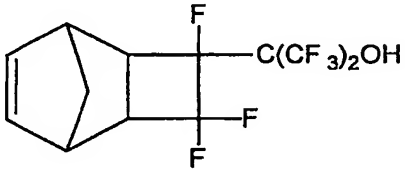


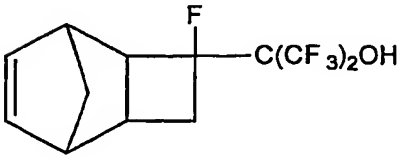


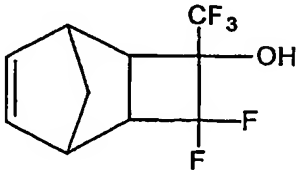












wherein R^{12} is an alkyl group of 1 to 20 carbon atoms.

21. The photoresist composition of Claim 19, wherein (a) is a fluoroolefin comprising 2 to 20 carbon atoms.

22. The photoresist composition of Claim 21, wherein the fluoroolefin is selected from the group consisting of tetrafluoroethylene; hexafluoropropylene; chlorotrifluoroethylene; vinylidene fluoride; vinyl fluoride; perfluoro-(2,2-dimethyl-1,3-dioxole); perfluoro-(2-methylene-4-methyl-1,3-dioxolane); $CF_2=CFO(CF_2)_tCF=CF_2$, wherein t is 1 or 2; and $R_f"OCF=CF_2$, wherein $R_f"$ is a saturated fluoroalkyl group of from 1 to 10 carbon atoms.

23. The photoresist composition of Claim 22, wherein the fluoroolefin is tetrafluoroethylene.

24. The photoresist composition of Claim 19, wherein the fluorine-containing polymer further comprises a unit containing a fluoroalcohol group or a protected fluoroalcohol group.

25. The photoresist composition of Claim 24, wherein the fluoroalcohol group or the protected fluoroalcohol group is derived from at least one ethylenically unsaturated compound containing a fluoroalcohol group having the structure:

$$-C(R_f)(R_f')OH$$

wherein R_f and R_f' are the same or different fluoroalkyl groups of from 1 to 10 carbon atoms or taken together are $(CF_2)_m$ wherein m is 2 to 10.

26. The photoresist composition of Claim 25, wherein R_f and R_f' are perfluoroalkyl groups.

27. The photoresist composition of Claim 19, wherein the fluorine-containing polymer further comprises a fluoroalcohol group having the structure:

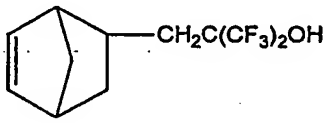
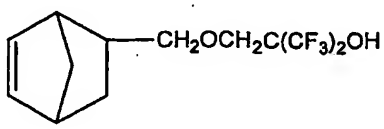
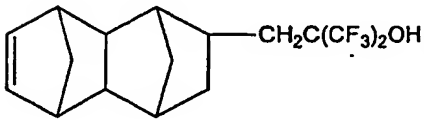
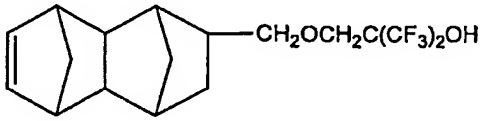
$$-XCH_2C(R_f)(R_f')OH$$

wherein R_f and R_f' are the same or different fluoroalkyl groups of from 1 to 10 carbon atoms or taken together are $(CF_2)_m$ wherein m is 2 to 10; and X is an element from Group VA and VIA of the Periodic Table of the Elements.

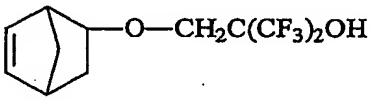
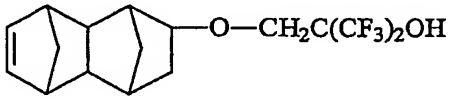
28. The photoresist composition of Claim 27, wherein X is selected from the group consisting of oxygen, sulfur, nitrogen and phosphorous.

29. The photoresist composition of Claim 28, wherein X is oxygen.

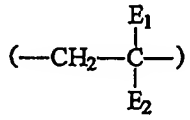
30. The photoresist composition of Claim 25, wherein the monomer containing the fluoroalcohol functional group or the protected fluoroalcohol group is selected from the group consisting of:

CH_2=CHO$CH_2CH_2OCH_2C(CF_3)_2OH$ CH_2=CHO$(CH_2)_4OCH_2C(CF_3)_2OH$

31. The photoresist composition of Claim 19, wherein the fluorine-containing polymer further comprises at least one acid-containing or protected acid-containing group of structural unit:



wherein E_1 is H or C_1-C_{12} alkyl; E_2 is CO_2E_3, SO_3E, or other acidic group; and E and E_3 are independently selected from the group of H, unsubstituted C_1-C_{12} alkyl, and heteroatom substituted C_1-C_{12} alkyl.

32. The photoresist composition of Claim 31, wherein the heteroatom is selected from the group consisting of oxygen, nitrogen, sulfur, halogen and phosphorus atoms.

33. The photoresist composition of Claim 32, wherein the heteroatom is oxygen, and the heteroatom substituted C_1-C_{12} alkyl further comprises a hydroxyl group.

34. The photoresist composition of Claim 31, wherein the acid-containing or protected acid-containing group is a carboxylic acid-containing monomer.

35. The photoresist composition of Claim 34, wherein the acid-containing or protected acid-containing group is selected from the group consisting of tert-butyl acrylate; 2-methyl-2-adamantyl acrylate; 2-methyl-2-norbornyl acrylate and acrylic acid.

36. The photoresist composition of Claim 19, wherein the fluorine-containing polymer further comprises at least one group derived from a polar monomer.

37. The photoresist composition of Claim 19, wherein the photoactive component is a photoacid generator.

38. The photoresist composition of Claim 19, further comprising a dissolution inhibitor.

39. The photoresist composition of Claim 19, further comprising a solvent.

40. The photoresist composition of Claim 39, wherein the solvent is selected from the group consisting of an ether ester; a ketone; an ester; a glycol ether; a substituted hydrocarbon; an aromatic hydrocarbon; a fluorinated solvent and super critical CO_2.

41. The photoresist composition of Claim 19, further comprising at least one additive selected from the group consisting of bases, surfactants, resolution enhancers, adhesion promoters, residue reducers, coating aids, plasticizers, and T_g (glass transition temperature) modifiers.

42. A coated substrate comprising:

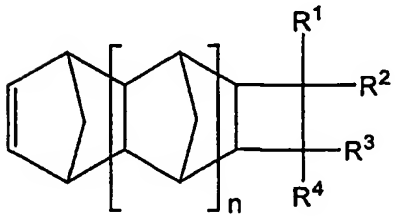
(1) a substrate; and

(2) a photoresist composition comprising:

(a) a fluorine-containing polymer comprising a repeat unit derived from:

(i) at least one repeat unit derived from an ethylenically unsaturated compound having at least one fluorine atom covalently attached to an ethylenically unsaturated carbon atom; and

(ii) at least one repeat unit derived from an ethylenically unsaturated compound having the structure:



(I)

wherein n is 0, 1, or 2;

R^1, R^2, R^3 and R^4 are independently H, OR^5, halogen, alkyl or alkoxy of 1 to 10 carbon atoms, optionally substituted by halogen or ether oxygens, Y, $C(R_f)(R_f')OR^5$, R^6Y or OR^6Y;

Y is COZ or SO_2Z;

R^5 is hydrogen or an acid-labile protecting group;

R_f and R_f' are the same or different fluoroalkyl groups of 1 to 10 carbon atoms or taken together are $(CF_2)_m$ where m is 2 to 10;

R^6 is an alkylene group of 1 to 20 carbon atoms, optionally substituted by halogen or ether oxygen;

Z is OH, halogen, or OR^7; and

R^7 is an alkyl group of 1 to 20 carbon atoms, with the proviso that at least one of R^1, R^2, R^3 and R^4 is Y, OR^5, $C(R_f)(R_f')OR^5$, R^6Y or OR^6Y, and the proviso that if R^1 (or R^3) is OH, R^2 (or R^4) is not OH or halogen; and

(b) a photoactive component.

43. The coated substrate of Claim 42, wherein the substrate is a microelectronic wafer.

44. The coated substrate of Claim 43, wherein the microelectronic wafer comprises a material selected from the group consisting of silicon, silicon oxide, silicon oxynitride, and silicon nitride.

45. A reaction product of quadracyclane and a fluoroalkylbenzoate compound.

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(71) Applicant *(for all designated States except US)*: E. I. DU PONT DE NEMOURS AND COMPANY [US/US]; 1007 Market Street, Wilmington, DE 19898 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: FEIRING, Andrew, E. [US/US]; 7 Buckridge Drive, Wilmington, DE 19807 (US). SCHADT, Frank, L., III [US/US]; 2407 Delaware Avenue, Wilmington, DE 19806 (US). PETROV, Vlacheslav Alexandrovich [RU/US]; 2 Cappa Court, Hockessin, DE 19707 (US). SMART, Bruce, Edmund [US/US]; 22 Beethoven Drive, Wilmington, DE 19807 (US). FARNHAM, William, Brown [US/US]; 123 Dewberry Drive, Hockessin, DE 19707 (US).

(74) Agent: SINNOTT, Jessica, M.; E. I. DU PONT DE NEMOURS AND COMPANY, Legal Patent Records Center, 4417 Lancaster Pike, Wilmington, DE 19805 (US).

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(54) Title: FLUORINATED POLYMERS HAVING POLYCYCLIC GROUPS WITH FUSED 4-MEMBERED CARBOCYCLIC RINGS, USEFUL AS PHOTORESISTS, AND PROCESSES FOR MICROLITHOGRAPHY

(57) Abstract: This invention provides novel fluorine containing polymers which comprise at least one fluorinated olefin, at least one polycyclic ethylenically unsaturated monomer with a fused 4-membered carbocyclic ring and, optionally, other components. The polymers are useful for photoimaging compositions and, in particular, photoresist compositions (positive-working and/or negative-working) for imaging in the production of semiconductor devices. The polymers are especially useful in photoresist compositions having high UV transparency (particularly at short wavelengths, e.g., 157 nm) which are useful as base resins in resists and potentially in many other applications.